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# Three New Costa Rican Species of *Calathea* (Marantaceae) from Montane Wet Forests

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**ABSTRACT.** Three species of *Calathea* G. Mey. in *Calathea* sect. *Calathea* (Marantaceae) are described as new from montane wet forest habitats in Costa Rica: *C. recurvata* H. Kenn., *C. tarrazuensis* H. Kenn., and *C. verruculosa* H. Kenn. These are found in montane wet, montane rainforest, or cloud forest habitats at mid to higher elevations from 800 to 1500 m. All three taxa are endemic to Costa Rica. *Calathea recurvata* differs from related distichous-bracted species by the close vein spacing (30 to 35 lateral veins per 3 cm) of the leaf, pale whitish green to yellowish green bracts with recurved apical margins, clavicate bracteoles, yellow or pink corolla lobes, and yellow or pink-purple staminodes. *Calathea verruculosa* is distinguished by the shiny dark green ovate leaf, verruculose petioles and peduncles, stiff lime-green bracts with apically recurved margins, clavicate bracteoles, and yellow corolla and staminodes. *Calathea tarrazuensis* is distinguished by the narrowly ovate-elliptic leaf with length:width ratios of 2.13–4.8:1 and an acuminate-attenuate apex, the glabrous pulvinus, relatively long peduncles (44–111 cm), the elliptic olive-green bracts with the uppermost bract incoiled on itself not subtending flowers, the apically flattened, slightly thickened bracteoles, and the cream-white flowers.

**RESUMEN.** Tres especies de *Calathea* G. Mey. dentro de *Calathea* sect. *Calathea* (Marantaceae) se describen como nuevas, las cuales crecen en bosque húmedo, pluvial o nublado, a elevaciones medias desde 800 hasta 1500 m. Las tres especies son endémicas de Costa Rica. Entre las especies con inflorescencias dístico-bracteadas, *C. recurvata* se distingue por la corta distancia entre los nervios laterales de la hoja (30 hasta 35 nervios laterales por cada 3 cm), las brácteas blanquecino-verdosas a amarillo-verdoso pálidas con los márgenes apicales recurvados, las bractéolas claviculadas, los lóbulos de la corola amarillo claros o rosados y los estaminodios amarillos o purpúreo-rosados. *Calathea verruculosa* se distingue por las láminas foliares ovadas, verde oscuro brillantes, los pecíolos y pedúnculos verruculosos, las brácteas cartáceas,

verde-lima con los márgenes apicales recurvados, las bractéolas claviculadas, y la corola y los estaminodios amarillos. *Calathea tarrazuensis* se distingue por las hojas ovado-elípticas angostas, 2.13–4.8 veces tan largas como anchas, con ápice acuminado-atenuado, el pulvínulo glabro, pedúnculos largos (44–111 cm), las brácteas elípticas de color verde aceituna con la última bráctea enrollada y sin flores, las bractéolas aplanadas apicalmente y poco gruesas, y las flores blanco-crema.

**Key words:** *Calathea*, *Calathea* sect. *Calathea*, Costa Rica, IUCN Red List, Marantaceae, montane wet forest.

Since Standley's treatment of Marantaceae for the *Flora of Costa Rica* (Standley, 1937), there has been a substantial increase in the number of species known from Costa Rica. Standley listed a total of 28 species, of which 26 are currently recognized as distinct, 14 in the genus *Calathea* G. Mey. Standley noted nine species as endemic, six in *Calathea*. Currently, only two of the nine are still considered endemic. By 1978, there was a total of 46 species recognized, an increase of ca. 77% for the family (Kennedy, 1978) with 13 noted as endemic. The percent increase recorded for the genus *Calathea* was greater, ca. 120%, with 31 species. Of the 20 species added since Standley (1937), five were new records and 15 were previously undescribed species. With increased collecting in Costa Rica, the number of reported species is now more than double what Standley reported. This is partly due to improvement of access through new or improved roads, but is largely due to the concerted collecting by the botanists at the Instituto de Biodiversidad to inventory the flora. In the Marantaceae treatment in *Manual de Plantas de Costa Rica* (Kennedy, 2003), 56 species (an increase of 115% from Standley's flora) were reported for the family, of which 41 (ca. 190% increase) were in the genus *Calathea*. Of the 41 species, two were undescribed, but mentioned as *Calathea* sp. A and *Calathea* sp. B in the *Manual* treatment, and are described herein. Currently, 59 species (18 endemic) are recognized for the family, of

which 44 are in *Calathea* (12 endemic). Of the three additional *Calathea* species, two are endemic to Costa Rica (one described herein, and one to be described), while the third is a new species to be described, found in Panama and Costa Rica. Interestingly, six of the 12 endemic species in the genus are in *Calathea* sect. *Calathea*. Only one, *C. platystachya* Standl. & L. O. Williams, is a lowland species; the other five occur in montane wet or cloud forest habitats, above 800 m. This suggests a burst of speciation in *Calathea* sect. *Calathea* in montane habitats in Costa Rica.

Petersen (1890: 89) treated *Calathea* sect. *Calathea* as "Sect. VII. Distichae." Schumann (1902) called it *Calathea* subg. *Eucalathea* and characterized its plants as having distichous bracts and laterally complanate inflorescences. The new species described here clearly exhibit these characters. In general, *Calathea* sect. *Calathea* is characterized by the presence of several basal leaves and a single cauline leaf subtending one to several distichous-bracted, complanate inflorescences, open flowers, and usually yellow capsules with deep blue seeds bearing white arils. Naturally there is variation and not all species exhibit all of these characters. Specimens of several species with distichous bracts have been previously determined as *C. crotalifera* S. Watson, a common and widespread species, as specimens are much more similar in general aspect than are the living plants. The distinctive bract color, recurved bract margins, and bracteole characters of the new species are less obvious in pressed specimens. The new species have bracts that are pale whitish green to pale yellowish green, chartreuse to lime-green or olive-green, but not the bright yellow to yellow-orange of *C. crotalifera*.

**1. *Calathea recurvata*** H. Kenn., sp. nov. TYPE: Costa Rica. San José: Cantón de Vasquez del Coronado, below Bajo La Hondura, Río La Hondura drainage, trail below finca, steep slopes, 1100 m, 10°04'N, 83°59'W, 20 Sep. 1972, H. Kennedy 1680 (holotype, CR; isotypes, INB, K, MO, U not seen, UBC). Figure 1.

Haec species a congeneris bracteis distichis praeditis foliorum venis lateralibus crebris (30 ad 35 per 3 cm), bracteis sat grandibus pallide albido-vel flavido-viridibus marginibus apicalibus recurvatis, bracteolis claviculatis, lobis corollinis flavis roseolisve atque staminodiis flavis roseopurpureisve distinguitur.

Herb, 1.8–3.5 m high, bearing 2 to 5 basal leaves and 1 cauline leaf above a stem internode of 50–120 cm; stem green, node yellowish, node and uppermost portion of stem appressed tomentose; cataphylls

narrowly ovate, apiculate, innermost cataphyll 50–110 cm. Leaf blade coriaceous, ovate, 53–92 × 30–60 cm (length:width ratios 1.4–1.95:1), apex rounded with a slightly eccentric acumen, base obtuse to rounded, lateral veins 30 to 35 per 3 cm (measured at midpoint of each side of blade); leaf blade shiny deep green adaxially, glabrous, often the acumen minutely appressed tomentose, midrib yellow-green, glabrous in basal 1/2 to 2/3, sparsely minutely tomentose (×14 magnification) apically; leaf surface dull olive-green abaxially with marginal band tinged purple, sparsely minutely tomentose, basal portion and toward midrib subglabrous with hairs concentrated along major veins, hairs denser and more evenly dispersed toward margin and apically, hairs 0.2–0.3 mm arising from swollen basal cushion of cells, midrib yellow-green, appressed tomentose throughout apically, hairs ca. 0.5 mm, toward base subglabrous or tomentose only along sides; pulvinus elliptic in cross section, olive-green, glabrous, 10–24 cm; petiole green, faintly scabrous, 40–120 cm; leaf sheath not auriculate, green, densely pubescent along margin; sheath of cauline leaves 16–43 cm, in basal leaves, 70–110 cm. Inflorescences 1 to 4 per shoot, first one terminal, subsequent ones axial, in axil of subtending leaf, strongly complanate, rectangular, 15–28 × 6–8.5 cm; peduncle green, densely appressed tomentose in upper 0.5–1 cm, subglabrous below, 25.5–55(–65) cm; bracts 16 to 35, distichous, imbricate, chartaceous, transverse broadly obovate, conduplicate, apex retuse, apical margins recurved, 3.2–4 × 4–5.5 cm, lowermost bract occasionally noticeably separated from upper ones, each subtending up to 5 or more flower pairs, bracts pale whitish green to pale yellow-green, outer surface faintly hispid to touch, sparsely minutely tomentose (×16 magnification) and recurved along the margin and at apex, the rest subglabrous to glabrous, inner surface dull, glabrous; inflorescence rachis often exposed in dried material, densely appressed tomentose, hairs 0.5–0.7 mm; bicarinate prophyll membranous, broadly elliptic, apex truncate to shallowly retuse, translucent light yellow-green, minutely appressed tomentose on sides and adjacent surface of carina, central portion glabrous, 2.1–2.2 × 1.3–1.6 cm, 0.8–0.9 cm wide from carina to carina; secondary bract membranous, elliptic, apex obtuse to emarginate, light yellow-green, appressed pilose at apex and apical margins, glabrous basally, 1.6–2 × 0.8–1.5 cm; bracteoles 1 per flower pair, indurate clavicate, medial, white basally, upper clavicate portion yellow to pale yellow-green, 1.8–2.4 cm. Sepals channeled, narrowly obovate, obtuse to 90°, cupped apically, white to pale cream-colored basally, yellow-green at apex, glabrous or very sparsely

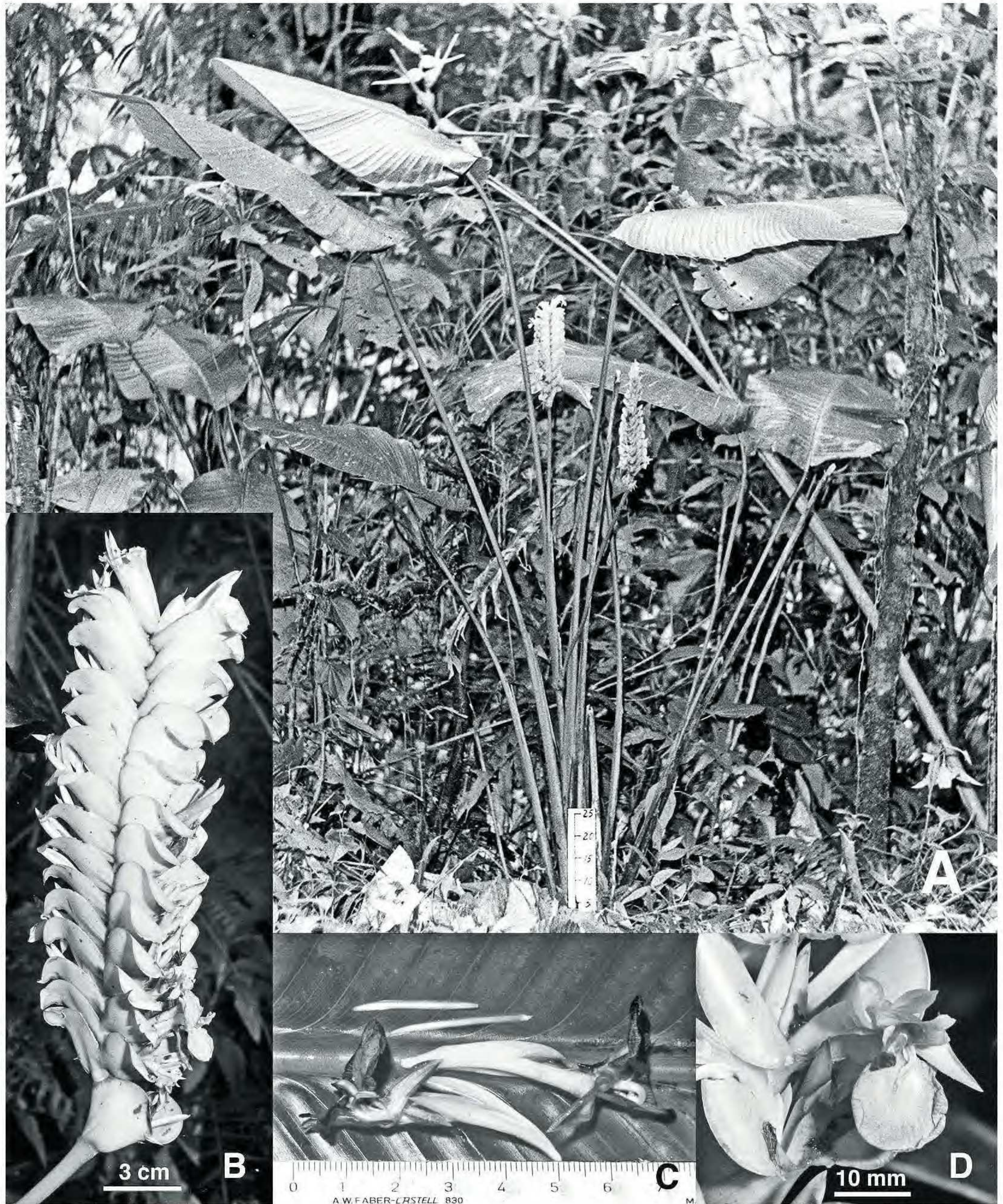


Figure 1. *Calathea recurvata* H. Kenn. —A. Habit. —B. Inflorescence. —C. Flowers and clavicate bracteoles photographed against the adaxial leaf surface. —D. Flower, face view. Photos A and B of Kennedy 1558 (MO); photos C and D of Kennedy & DeVris 3773 (CR). Photos by the author.

minutely pubescent at apex,  $23\text{--}27 \times 4\text{--}6$  mm; corolla ca.  $43\text{--}44$  mm; tube pale yellow or pale pink, sparsely appressed pilose, ca. 24 mm; staminal tube 8–10 mm; corolla lobes subequal, elliptic to obovate, obtuse to  $90^\circ$ , margins inrolled, appearing acute, pale cream-colored to light yellow basally, yellow-green at

apex or pale pink, appressed pilose,  $16\text{--}22 \times 5\text{--}6$  mm; outer staminode obovate, retuse, yellow or deep pink throughout or pink to peach centrally with the marginal portion purple to dark purple, ca.  $17 \times 16$  mm; callous staminode oblong, apex petaloid, unequally bilobed, pale yellowish throughout or pink

to peach-colored basally with apical petaloid portion purplish or dark purplish pink, ca.  $22 \times 7$  mm; cucullate staminode light yellow throughout or pinkish purple basally with hood and trigger purple to dark purple, ca. 8 mm; stamen with lateral pink-purple, petaloid appendage; anther yellow, 3.5–4 mm; style and stigma pale yellowish or pink-purple; ovary white, glabrous, ca.  $3 \times 2$  mm. Capsule smooth, obovoid, cream-colored or pink-purple, glabrous, ca.  $13 \times 8$  mm, crowned by an enlarged, persistent, pale green calyx to 27 mm; seeds usually 3 per capsule, trigonous, dark blue, ca.  $6 \times 4.5 \times 3$  mm, bearing a white aril to 4 mm.

*Distribution and phenology.* *Calathea recurvata* occurs at mid to upper elevations for Marantaceae, collected from 800 to 1300 m in montane rainforest and cloud forest habitats. Flowering is noted to extend from July through January.

*IUCN Red List category.* Conservation for *Calathea recurvata* must be considered as Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001), because it is known from many collections and has been found in both San José and Cartago provinces.

*Etymology.* The specific epithet, *recurvata*, refers to the recurved apical margins of the bracts.

*Discussion.* *Calathea recurvata* belongs to *Calathea* sect. *Calathea*, having the characteristic habit of several basal leaves and a cauline leaf subtending the one to several, distichous-bracted inflorescences. This new species is distinguished from other related species of *Calathea* with distichous bracts by the relatively large ( $3.2\text{--}4 \times 4\text{--}5.5$  cm), pale whitish to yellowish green bracts with recurved apical margins, the yellow or pink-purple petals and staminodes, and the clavicate bracteoles. It is closely related to two undescribed Panamanian species from similar cloud forest habitats in the bordering provinces of Chiriquí and Bocas del Toro, which will be described in a subsequent paper. Although the recurved bract margin is quite distinctive in the field, it may or may not be obvious in pressed material, but generally at least some bracts exhibit this character. *Calathea recurvata*, *H. Kennedy 1558* (BM, CR, DUKE, INB, MO, US), is the species referred to as “*C. sp. A.*” in *Manual de Plantas de Costa Rica* (Kennedy, 2003: 654).

*Paratypes.* COSTA RICA. **Cartago:** forest beside Río Gato, 29 Dec. 1973, *R. Lent 3725* (CR, F); near Selva on hillside above Río Taus,  $09^{\circ}45'N$ ,  $83^{\circ}45'W$ , 2 Aug. 1972, *J. Taylor & C. Taylor 11471* (BRIT). **San José:** Cantón de Vasquez de Coronado, below La Palma, Río Claro (upper Río La Hondura), along trail to Guapiles,  $10^{\circ}03'N$ ,

$83^{\circ}58'W$ , 1 Jan. 1967, *W. C. Burger 4133* (BM, CR); below La Palma, NE of San Jerónimo, Río Claro valley (Río La Hondura drainage),  $10^{\circ}03'N$ ,  $83^{\circ}58'W$ , 19 Nov. 1969, *W. C. Burger, R. Baker & J. Utley 6250* (CR); 23 Oct. 1975, *W. C. Burger, R. Baker & J. Utley 9388* (AAU, CR, US); Parque Nac. Braulio Carrillo, La Palma, Río Bajo La Hondura, 23 Jan. 1983, *N. Garwood, M. Gibby, R. J. Hampshire & C. J. Humphries 371* (BM, CR, MO); Parque Nac. Braulio Carrillo, Cuenca del Sarapiquí, Quebrada Sanguijuela, 15 km E del Tunel Zurquí,  $10^{\circ}09'28''N$ ,  $83^{\circ}57'49''W$ , 18 July 1997, *B. Hammel, G. Swick & S. Troys 21004* (INB, MO); below Bajo La Hondura, Río La Hondura drainage, trail below the finca,  $10^{\circ}04'N$ ,  $83^{\circ}59'W$ , 6 Sep. 1972, *H. Kennedy 1558* (BM, CR, DUKE, INB, MO, US); Bajo La Hondura,  $10^{\circ}04'N$ ,  $83^{\circ}59'W$ , 8 Sep. 1976, *H. Kennedy & P. DeVris 3773* (CR, INB, PMA, UCR); Parque Nac. Braulio Carrillo, ca.  $10^{\circ}04'N$ ,  $84^{\circ}00'W$ , 28 Aug. 1990, *H. Kennedy 4585* (CR, INB, MO); Parque Nac. Braulio Carrillo, trail from La Ventana to Río La Hondura,  $10^{\circ}04'20''N$ ,  $84^{\circ}59'00''W$ , 4 Sep. 1990, *H. Kennedy & J. Solomon 4600* (CR, INB, MEXU, MO, UCR); Parque Nac. Braulio Carrillo, La Montura, along ridge, 25–30 July 1982, *C. Todzia 1958* (CR).

**2. *Calathea verruculosa* H. Kenn., sp. nov.** TYPE: Costa Rica. Cartago: Cantón de Turrialba, 6 km W of La Suiza on rd. to Pacayitas, small, wet forest remnant, 1200 m,  $09^{\circ}52'20''N$ ,  $84^{\circ}35'10''W$ , 8 Sep. 1990, *H. Kennedy & J. Solomon 4646* (holotype, CR; isotype, MO). Figure 2.

Haec species a congeneris bracteis distichis praeditis petiolis pedunculisque verruculosus, lamina foliari nitida atroviridi late ovata, bracteis rigidis flavovirentibus marginibus apicaliter recurvatis, bracteolis claviculatis atque corolla staminodiisque flavis distinguitur.

Caulescent herb, 0.9–1.9 m high, bearing 1 to 3(to 5) basal leaves and (0)1(2) cauline leaves above a stem internode of 27–140 cm; cataphylls coriaceous, narrowly ovate, apiculate, dark green tinged with purple or purple, verruculose and hispid, innermost cataphyll 14.5–37 cm; stem dark green or tinged reddish brown, verruculose, though less pronounced than on petiole, scabrid. Leaf blade stiff, chartaceous, broadly ovate,  $20\text{--}55 \times 12\text{--}32$  cm (length:width ratios 1.5–1.9:1), apex obtuse with pronounced slightly eccentric acumen, base broadly obtuse to truncate; leaf blade shiny deep green adaxially, glabrous except acumen and adjacent apical margins tomentose, midrib olive-green, tomentose, more densely so toward apex; leaf surface with a less shiny sheen abaxially, deep grayish green to olive-green, glabrous except minutely tomentose at apex and along the very margin, midrib yellow-green, minutely appressed tomentose; pulvinus elliptic in cross section, nearly 2× as deep as wide, olive-green, glabrous or minutely tomentose along front, nearly confluent, (2.1–)3–8(–9.5) cm; petiole dark green or

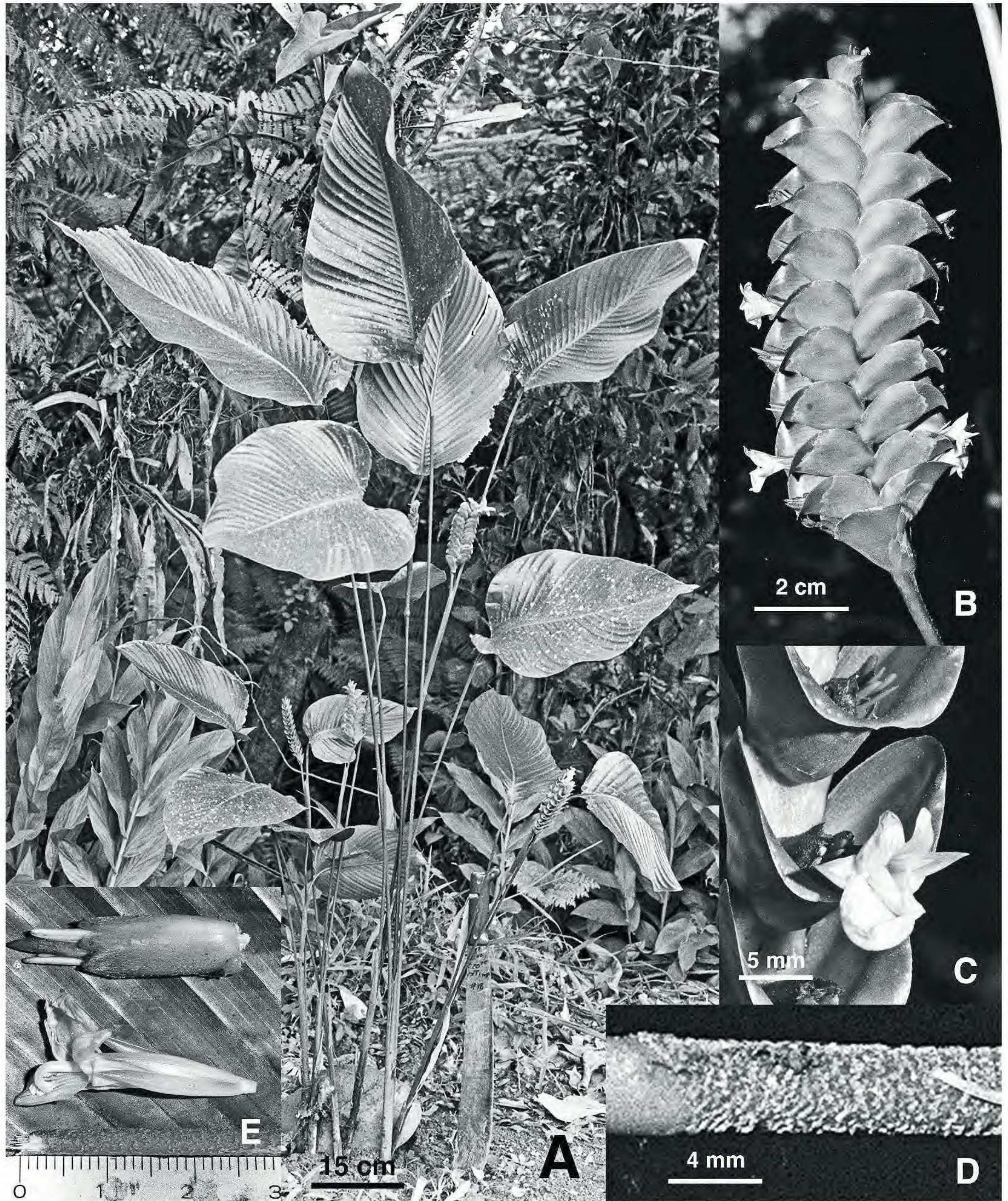


Figure 2. *Calathea verruculosa* H. Kenn. —A. Habit. —B. Inflorescence. —C. Flower, face view. —D. Base of pulvinus and upper portion of verruculose petiole. —E. Flower (lower), bicarinate prophyll with secondary bract and clavicate bracteoles (above) photographed against the adaxial leaf surface. Photos A and D of the type, *Kennedy & Solomon 4646* (CR, MO); photos B, C, and E of a plant cultivated at Wilson Botanical Garden from Tuis, *Kennedy 3737* (INB). Photos by the author.

tinged purple apically, verruculose, junction to pulvinus densely appressed tomentose, hairs to 0.6 mm, minutely tomentose where verruculose as well, hairs much denser on subtending leaf petiole, 5–10 cm in cauline leaves, 18–95 cm in basal leaves; leaf sheath not auriculate, dark olive-green to dark green,

often tinged purple at apex and along margin in cauline leaves, dark green streaked purple in basal leaves, center back verruculose and scabrid, hairs on minute excrescences, wings finely grooved with indented lines, hispid, margin ciliate, hairs to 1 mm, longer toward margin and base, 10–16.5 cm in

cauline leaves, 25–62 cm in basal leaves; base of leaf sheath yellow-green, appressed tomentose, hairs to 1 mm long. Inflorescences 1 to 2 per shoot, terminal, strongly complanate, rectangular, (6.5–)8.5–13 × 3.5–4.2 cm; peduncle dark green, verruculose basally, apical 1 cm only slightly roughened, scabrid, (4.5–)8.5–31 cm; bracts 11 to 26, distichous, imbricate, stiff, chartaceous, transverse elliptic, conduplicate, apex emarginate, apical margins recurved, 2–2.9 × 2.5–3.4 cm; each bract subtending 5 or more flower pairs; outer surface of bracts chartreuse to lime-green, often a somewhat deeper green toward the margin, sparsely minutely tomentose at apex and along margins, much more so apically, the central portion subglabrous to glabrous at base; inner surface shiny, glabrous; bicarinate prophyll membranous, elliptic, apex rounded, translucent yellow-green, sides and carina tomentose, center back glabrous, 1.5–2 × 0.9–1.25 cm, 0.5–0.7 cm wide from carina to carina; secondary bract membranous, elliptic, apex emarginate, pale yellow-green, minutely tomentose apically, glabrous toward base, 1.5–1.9 × 0.9–1.2 cm; bracteoles 1 (rarely 2) per flower pair, indurate clavicate, medial, thickened apical portion yellow, white basally, glabrous, (1.6–)2–2.3 cm. Sepals thin herbaceous, narrowly elliptic, acute to obtuse, basal 1/2 translucent white, light green apically, darker at apex, glabrous to subglabrous with sparse minute hairs apically, ca. 0.2 mm long, 16–19 × 3.5–4 mm; corolla tube pale yellow, sparsely pilose, 12–18 mm; corolla lobes subequal, elliptic, acute to 90°, pale yellow to pale yellow-green apically, pilose, hairs ca. 0.5 mm, more dense toward apex, 9–12 × 3–4 mm; staminodes yellow; outer staminode broadly elliptic, apex rounded, ca. 8 × 7 mm; callous staminode rectangular, apex bilobed, lobes petaloid, the rest callous, ca. 10 × 4 mm; cucullate staminode ca. 4.5 × 3.5 mm; stamen with lateral petaloid appendage extending to apex of the anther; anther light yellow, ca. 2.5 mm; style and stigma light yellow; ovary smooth, cream-colored, glabrous, ca. 2 × 1 mm. Capsule obovoid, light yellow, glabrous, ca. 12 mm high, crowned by a persistent calyx; seeds trigonous, rugose on outer surface, blue, ca. 6 × 4.5 × 3 mm, bearing a white aril.

*Distribution and phenology.* *Calathea verruculosa* occurs at mid-elevations, 800–1300 m, in premontane wet to cloud forest habitat, in moderate to dense shade often near streams. Flowering is noted primarily during the rainy season, from June to September.

*IUCN Red List category.* Conservation for *Calathea verruculosa* should be considered as Data

Deficient (DD) according to IUCN Red List criteria (IUCN, 2001), because it is known only from a few collections. The area where it is found is not readily accessible except just along the road, but certainly further exploration of the area is merited.

*Etymology.* The specific epithet, *verruculosa*, refers to the warty, verruculose petioles that are a highly distinctive feature of this species.

*Discussion.* *Calathea verruculosa* belongs to *Calathea* sect. *Calathea*. This new species is readily distinguished from other distichous-bracted species by the stiff, chartreuse to lime-green bracts with reflexed apical margins; yellow flowers; readily visible clavicate bracteoles; chartaceous, shiny, deep green, broadly ovate leaf blades; and, most notably, the warty, verruculose petioles and peduncles. Even in sterile plants, this last character is so distinctive that the plant can be readily identified. It is most similar to an undescribed species from Panama that will be described in a subsequent paper. One paratype for *C. verruculosa*, Kennedy & Hammel 5171 (CR, INB, UBC), was referred to as “*C. sp. B*” in *Manual de Plantas de Costa Rica* (Kennedy, 2003: 654).

*Paratypes.* COSTA RICA. **Cartago:** Cantón de Turrialba, Tayutic, Vereh. Grande de Oro, Cuenca superiore, 09°48'05"N, 83°29'30"W, 29 July 1995, G. Herrera & A. Cascante 8203 (CR); Cantón de Turrialba, 6 km N of La Suiza on rd. to Pacayitas, 09°52'15"N, 83°35'25"W, 9 Oct. 1990, H. Kennedy & B. Hammel 5167 (INB, MO); Cantón de Turrialba, ca. 10 km N of La Suiza on rd. to Pacayitas, 09°52'15"N, 83°35'25"W, 9 Oct. 1997, H. Kennedy & B. Hammel 5171 (CR, INB, UBC); Cantón de Turrialba, rd. betw. Moravia & Grande de Oro, E of La Suiza, 09°49'20.1"N, 83°26'49.1"W, 13 July 1992, W. J. Kress, C. S. Roesel, B. Bowditch, M. Anderson & T. Prinzie 92–3502 (INB, MO, US).

*Cultivated plant.* COSTA RICA. **Cartago:** near Tuis, cultivated at Wilson Botanical Garden, Las Cruces, 6 km S of San Vito de Java, vouchered 3 Sep. 1976 as H. Kennedy 3737 (INB).

**3. *Calathea tarrazuensis* H. Kenn., sp. nov. TYPE:** Costa Rica. San José: Cantón de Tarrazú, 7.5 km from fork in rd. for Naranjita versus Quepos/Esquipales, in forest on slope along rd., 1084 m, 09°33'51"N, 84°03'06"W, 14 July 2005, H. Kennedy, B. Hammel, I. Pérez & F. Morales 5995 (holotype, INB; isotypes, CR, MEXU, MO, UCR, USJ). Figure 3.

Haec species inter congeneros bracteis distichis praeditis quoad foliorum formam colorem texturamque etiam bracteis pubescentes *Calathea lasiostachyae* Donn. Sm. maxime affinis, sed ab ea inflorescentia proportione latiore brevior-

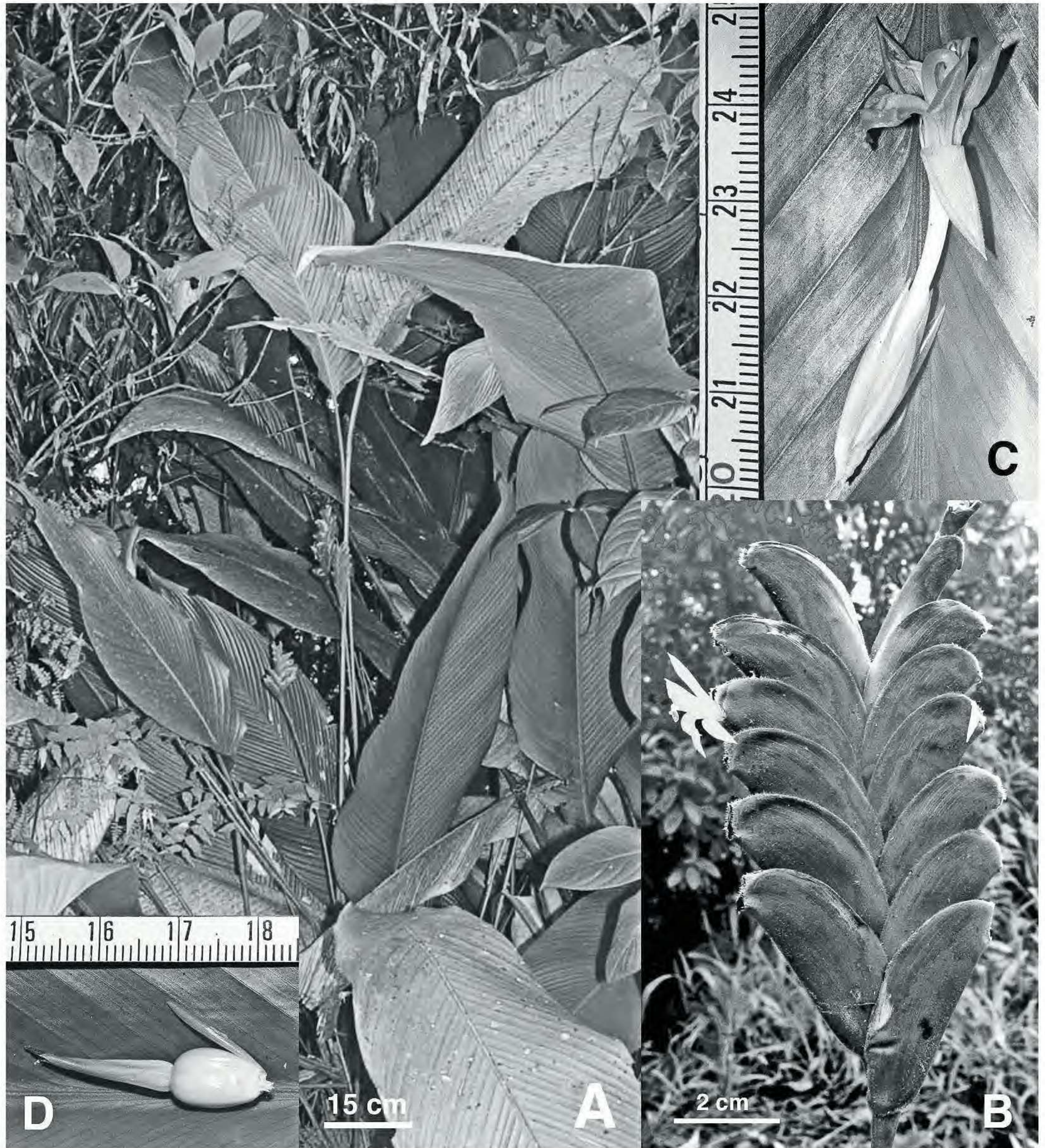


Figure 3. *Calathea tarrazuensis* H. Kenn. —A. Habit. —B. Inflorescence. —C. Flower photographed against leaf. —D. Capsule photographed against leaf. Photos A and B of the type, Kennedy *et al.* 5995 (INB, MO); photos C and D of Kennedy *et al.* 5115 (INB). Photos by the author.

eque, bracteis paucioribus semper longioribus quam latioribus atque floribus cremeo-albidis distinguitur.

Rhizomatous herb, 1.6–3.9 m high, bearing 4 to 7 basal leaves and 1 cauline leaf above a 0.6–3 m stem internode. Leaf blade coriaceous, narrowly ovate-elliptic, (48–)74–106 × (10–)26–41 cm, subtending leaf 52–94 × 12–39 cm (length:width ratios [2.13–] 3.11–4.12[–4.8]:1), the lowermost basal leaf much smaller than subsequent leaves, apex acuminate

attenuate, base obtuse to rounded, shortly attenuate; leaf blade deep green adaxially, glabrous but sparse tomentose in apical 5 mm of apex, midrib olive-green, sparse tomentose along margins in basal portion becoming more densely tomentose, but only in center apically, subglabrous at apex; leaf surface dull abaxially, matte green with slight yellowish cast, sparsely appressed tomentose apically, becoming sparsely hispid in basal 3/4–4/5, excrescences, ca. 0.1 mm, felt more than seen, midrib yellow-green

basally grading to yellow near apex, appressed tomentose throughout apically, hairs only along sides in basal portion; pulvinus olive-green, glabrous, (6.2–) 10.5–20 cm; petiole olive-green shading to yellowish, almost caramel-colored toward base, subglabrous to minutely scabrid just above sheath, 32–104 cm long in subtending cauline leaf, (39–)104–186(–236) cm long in others; leaf sheath not auriculate, caramel-colored on back, wings yellow-green to brownish yellow-green toward base, densely appressed tomentose along margins and at base, hairs to 1 mm, central portion minutely tuberculate; sheath of subtending cauline leaf 20–38 cm, others (27–)62–113 cm. Inflorescences 1 to 5 per shoot, the first terminal, subsequent ones lateral, borne in the axil of the subtending leaf, strongly complanate, rectangular, 9.2–13 × (3.2–)5.5–8 cm, width substantially less (to 2.3 cm) in young, nonflowering inflorescences; peduncle dark olive-green, appressed tomentose, very densely so at base, hairs more dense on abaxial side, 44–97(–111) cm; bracts 8 to 18, distichous, imbricate, coriaceous, elliptic, conduplicate, apex retuse, often dying back at apex, 3.8–4.5 × 2.8–3.5 cm, each bract subtending up to 4 or more flower pairs, outer surface of bracts deep olive-green, except light brown where dying back at apex, sparsely minutely appressed tomentose centrally, densely tomentose with longer hairs (ca. 1 mm) along margins and apex, inner surface deep olive-green, appressed tomentose centrally, just below sinus and on apical lobes, glabrous basally; rachis covered by bases of bracts, not visible in live or dried material; bicarinate prophyll firm centrally, thickened along the base of the carina, somewhat membranous toward margin, narrowly ovate-elliptic, apex ca. 90°, translucent light chartreuse, dying back at apex becoming orangish tan, sides and adjacent carina appressed tomentose, apical 1/5 of center back and carina tomentose, glabrous basally, 3.5–3.9 × 1.2–1.3 cm, 0.5–0.8 cm wide from carina to carina; secondary bract membranous but with 2 slightly thickened narrow vertical bands ca. 1/3 of the way in from margin, ovate, apex obtuse, somewhat shredded in age, light chartreuse, dying back at apex, becoming orangish tan, densely appressed tomentose in apical half and along margins, central basal portion glabrous, 3.3–3.5 × 1.2–1.4 cm; bracteoles 1 per flower pair, medial, dorsiventrally flattened, not quite indurate, basal portion membranous, slightly thicker near apex, linear, apex acute, white basally, very tip tinged yellow-orange, glabrous, 1.5–1.8 × 0.15–0.2 cm. Sepals membranous, narrowly elliptic-triangular, acute to 90°, white basally, apex tinged faint yellowish, glabrous or sparsely pilose in upper 2/3

but always with tuft of hairs at very apex (×14 magnification), hairs to 0.5 mm, 17–20 × 2–4 mm; corolla tube white, sparsely appressed pilose, 26–28 mm; corolla lobes subequal, elliptic, obtuse, white tinged faintly yellow at apex, appressed pilose, 12–15 × 4–5 mm; outer staminode broadly elliptic, clawed at base, rounded, white, faint yellow to yellow-green, apically, ca. 8 × 7 mm; callous staminode spatulate with one side wider than the other, apex off-center, obtuse, white, faintly tinged yellow-green apically, 11–13 × ca. 4.5 mm; cucullate staminode white, 5–6 × ca. 3 mm; stamen with narrow lateral petaloid appendage; anther yellow, 2.5–3 mm; style and stigma white; ovary smooth, white, glabrous, ca. 3 × 1.5 mm. Capsule obovoid, cream-colored, glabrous, 11–12.5 × 7–8 mm, crowned by a persistent calyx; seeds usually 3 per capsule, trigonous, blue, ca. 8.5 × 3.5 × 3.5 mm, bearing a white aril.

*Distribution and phenology.* *Calathea tarrazuensis* occurs at mid-elevations, from 845 to ca. 1500 m, in montane wet to cloud forest habitats, often in more open areas or near forest margins. Flowering is noted to be nearly year-round, from May to February, as this species occurs in areas of high rainfall.

*IUCN Red List category.* Conservation for *Calathea tarrazuensis* should be considered as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001), because it is only known from a restricted area and from only a few collections. The region where *C. tarrazuensis* is found is considerably less accessible than that of *C. verruculosa*, as the unpaved roads are virtually impassable in the rainy season; this makes collecting difficult, but at the same time lessens the threat.

*Etymology.* The specific epithet, *tarrazuensis*, refers to its restricted distribution, mainly in Cantón de Tarrazú, San José Province.

*Discussion.* *Calathea tarrazuensis* belongs to *Calathea* sect. *Calathea*. This species is distinguished by the narrowly ovate-elliptic leaf with length:width ratios of 2.13–4.8:1 and an acuminate-attenuate apex, the glabrous pulvinus, the long peduncles (44–97[–111] cm), the bracts longer than wide and deep olive-green dying back apically in early flowering, the uppermost bract incoiled on itself not subtending flowers, the single bracteole that is apically flattened but only slightly thickened, and the cream-white flowers. The new species is most closely related to *C. lasiostachya* Donn. Sm., sharing a similar leaf shape, color, and texture, with both taxa having pubescent bracts, though these hairs are longer and much more readily visible in *C.*



*lasiostachya*. *Calathea tarrazuensis* is distinguished from *C. lasiostachya* by the proportionately wider and shorter inflorescences ( $9.2\text{--}13 \times [3.2\text{--}]5.5\text{--}8$  cm vs.  $8\text{--}25 \times 5\text{--}7.5$  cm) with fewer bracts (8 to 18 vs. 18 to 38), and the cream-white versus yellow to pink or purplish flowers. The bracts are always longer than wide in *C. tarrazuensis* but are more variable in *C. lasiostachya*, whereas in many populations the bract width is equal to or greater than the length. In the field, the two species are mainly separated by altitude, with *C. lasiostachya* mainly found in the lowlands but recorded up to 1000 m and *C. tarrazuensis* found from 850 to 1500 m. In the key to species in the *Manual de Plantas de Costa Rica* (Kennedy, 2003: 632), *C. tarrazuensis* would key out under lead 11' due to its inflorescence to 8 cm wide and to its not having bracts with the waxy white, pruinose coating. There is a conflict with the if-then clause because the inflorescence is longer than 7.5 cm and is not more than 2.5 times as long as wide; however, it would key out with *C. retroflexa* H. Kenn. because they share the relatively shorter and wider inflorescence shape and the bracts that are always longer than wide. *Calathea tarrazuensis* differs from *C. retroflexa* in its uniformly green adaxial leaf surface versus the strongly contrasting whitish green to pale green area along the midrib and glabrous in *C. retroflexa*, the leaf length:width ratio greater than 2.13 (usually greater than 3) versus 2 or less, the straight versus reflexed inflorescence rachis, and the appressed tomentose versus glabrous bracts.

**Paratypes.** COSTA RICA. **Puntarenas:** Cantón de Parrita, along rd. from San Marcos to Fila Chonta, near Cerro Curú,  $09^{\circ}35'10''\text{N}$ ,  $84^{\circ}08'55''\text{W}$ , 27 Feb. 1999, *H. Kennedy, B. Hammel & F. Morales 5115* (INB, UCR). **San José:** Cantón de Tarrazú, ca. 12 km SW of San Marcos, on rd. to Quepos,  $09^{\circ}34'26''\text{N}$ ,  $83^{\circ}04'20''\text{W}$ , 14 July 2005, *H. Kennedy, B. Hammel & I. Pérez 6042* (INB, PMA); Cantón de Tarrazú, ca. 7 km from rd. fork for Naranjita versus Quepos/Esquipales,  $09^{\circ}33'51''\text{N}$ ,  $84^{\circ}03'06''\text{W}$ , 15 July 2005, *H. Kennedy, B. Hammel & I. Pérez 6044* (INB); Cantón de Tarrazú, Nápoles, Cerro Toro,  $09^{\circ}34'20''\text{N}$ ,  $84^{\circ}03'52''\text{W}$ , 1 May 1996, *J. Sánchez & G. Vargas 671* (CR); Cantón de Tarrazú, Fila Bustamante, San Isidro de Tarrazú, en borde de camino,  $09^{\circ}31'\text{N}$ ,  $84^{\circ}04'\text{W}$ , 27 Aug. 1987, *N. Zamora, I. Chacón & G. Herrera 1425* (CR, F, MO).

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